US ARMY
RDECOM

U.S. Army Research, Development and Engineering Command

★**CERDEC**

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TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

CERDEC Top Technologies

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Command and Control (C2D)

Mission: Enable quick transition of optimum capabilities to the Warfighter through research, development, integration and demonstration of technologies and capabilities, and through the unequaled support to our customers in all of our core mission areas - information and knowledge management; portable and mobile power; platform integration and prototyping; environmental control systems; and position and navigation.

Business Areas:
– Command and Control (C2)
– Power and Energy / Environmental Control Systems
– Positioning and Navigation
– Platform Integration and Prototyping

Night Vision & Electronic Sensors (NV&ESD)

Mission: Research and develop innovation that provides the Warfighter with advanced sensor technology that will acquire and target enemy forces; detect and neutralize mines, minefields and unexploded ordnances; deny enemy surveillance and acquisition through electro-optics, camouflage, concealment, and deception techniques; provide for night driving and pilotage; and, protect troops and fixed installations from enemy intrusion.

Business Areas:
– Ground Combat Systems
– Air Systems
– Countermine
– Science and Technology
– Modeling and Simulation
– Special Products and Prototyping

Intelligence & Information Warfare (I2WD)

Mission: By identifying, developing, evaluating, tailoring and inserting emerging information technologies into operational systems, I2WD provides our Warfighters effective intelligence and information warfare tools that equip America's Warfighter with the superior integrated systems needed to ensure information dominance.

Business Areas:
– Intelligence, Surveillance and Reconnaissance (ISR) Sensors
– ISR Processing
– Electronic Warfare (EW) Force Protection
– Information Operations
– Combat Identification (CID)
– Modeling and Simulation

Space & Terrestrial Communications (S&TCD)

Mission: Research, develop and evaluate trusted communications and networking technologies to transition operationally relevant solutions to the Warfighter through employment of a dedicated and superior workforce, world class facilities and global partnerships.

Business Areas:
– Information Assurance
– Network Operations
– Antennas
– Mobile Networking
– Systems Engineering
– Wireless Transport

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Technology: Service Oriented Architecture (SOA) Software Technologies for Planning, Execution and Monitoring of Full Spectrum Military Operations

Definition: Software technologies compliant and compatible with the emerging DoD and DA Service Oriented Architecture Foundations and the Global Information Grid (GIG) for:
- Development and analysis of Courses of Action (COAs) in asymmetric warfare that incorporate Diplomatic, Information, Military and Economic (DIME) / Political, Military, Economic, Social, Infrastructure, and Information (PMESII).
- Automated or highly computer assisted generation of threat target engagement and maneuver unit Courses of Action (COA) in highly mobile operations.
- Automated monitoring of plan execution in contingency operations and nation building operations.
- Automated workflow engine that is user programmable (Standard Operating Procedures or plan driven) and provides management of data exchanges and tasking of resources (computer and human) available in the C2 system to support operational threads, along with execution monitoring information to support commander/staff running estimate.

Technology: Urban and Indoor Position & Orientation for Small Platforms

Definition: Satellite based navigation systems are the predominate source of position information for military platforms. These systems, being based on RF propagation, do not work well in obstructed environments such as in urban areas or indoors. Auxiliary technologies such as inertial measurement units or peer-to-peer ranging may provide synergistic augmentations to satellite based navigation. The challenge is Size, Weight and Power plus Cost (SWAP-C) for small platforms. Platform applications include dismounted Soldiers, tactical vehicles, unmanned ground vehicles (UGVs) and non-dynamic manned / unmanned aircraft. Performance requirements in these platforms require position accuracy on the order of 1m (horizontal / vertical - 95%) and orientation accuracies on the order of 2 milliradians, at all times and in all environments.

Technology: Fuel Cells and Hybrid Systems

Definition: Fuel cells are electrochemical power sources that are designed to replenish their reactants during the production of electricity. The typical reactant at the anode is hydrogen; that at the cathode is oxygen. The reactants can be stored in a fuel cartridge or obtained from the environment. The fuel cell can be configured electrically in parallel with another electrochemical peak power device to form a hybrid power system. The fuel cell charges the other device and provides power during average load periods of the application. The peak power device will augment the power of the fuel cell during intermittent peak loads required by the application.

Technology: Rechargeable Batteries

Definition: Portable electrochemical power sources that can be electrically depleted during usage, and their energy fully restored by an external electrical source through charging.

Technology: Biometrics and Tagging, Tracking, and Location (TTL)

Definition: Biometric, electro-optical / infrared (EO / IR), radio frequency (RF), RF taggants, radar and other sensors, software, and related processing techniques to conduct non-cooperative detection, identification, location and tracking of individual people and vehicles in complex and chaotic urban terrain from stand-off distances.

Technology: Wide-Area Structure and Infrastructure Mapping

Definition: Ultra-wideband (UWB), ultra-high frequency / super-high frequency (UHF / SHF) synthetic aperture radar (SAR), other radar, radio frequency (RF), and other sensors, software and related processing techniques to penetrate and conduct 2D and 3D mapping of surface / sub-surface structures (of various materials) and infrastructure (e.g., power, phone, cable, sewer, etc.) while detecting, locating and identifying personnel, weapons, unexploded ordnance (UXO), and concealed weapons / concealed explosives (CW / CE) from stand-off distances.

Technology: Ground Penetrating Radar (GPR)

Definition: Breakthrough ultra wide band GPR technology to increase the effective on-road speed for detection of surface-laid and buried antitank (AT) landmines and in-road improvised explosive device (IED) threats, while maintaining a high probability of detection (Pd) and low false alarm rate (FAR). The low false alarm rate of the GPR enables fielding of a militarily useful capability for detection of mines / IEDs.

Technology: Airborne Electro-Optic / Infrared (EO / IR) Persistent Surveillance

Definition: Continuous electro-optic or infrared imagery of a large field of regard (> 25 km^2) at a temporal and spatial resolution sufficient to track vehicles and dismounts in cluttered terrain. Imagery can be segmented and transmitted to the ground to provide real-time situational awareness to many simultaneous users throughout the battlespace. Imagery can also be stored and indexed for future forensic analysis of enemy networks and tactics, techniques and procedures (TTPs). Airborne EO / IR persistent surveillance is a key overwatch technology for conducting asymmetric warfare in urban terrain.

Technology: Aided / Automatic Target Recognition (ATR)

Definition: ATR is a generic signal processing technology that detects and identifies targets for the Soldier. Hardware and software algorithms enable ATR systems to automatically acquire, track, recognize and identify threat targets. When these functions are performed by the signal processing in a night vision system, such as a thermal imager, the Soldier's workload is reduced and his accuracy increases, resulting in increased survivability and lethality. ATR will be extremely important to operational timelines on future battlefields which will be extremely dynamic and where decisions must be made quickly and based on as much relevant information as possible.

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Technology: Soldier Sensor Systems

Definition: There is an urgent need to enhance operations in urban and complex terrain as well as having the ability to utilize advanced optical capabilities to move under limited visibility conditions and all weather and light conditions, regardless of ambient lighting conditions. New Soldier sensor systems must have the ability to adjust rapidly to changes in lighting conditions, negating 'white out' effects normally experienced during close quarter urban operations.

Technology: Cognitive Radio and Cognitive NetOps

Definition:

•A Cognitive Radio is a Software Defined Radio (SDR) that is aware of its environment and its capabilities, can alter its physical layer behavior, and is capable of following complex adaptation strategies. A Cognitive Radio has awareness of changes in its environment and adapts its operating characteristics to improve its performance or to minimize a loss in performance.

•Cognitive NetOps technology will allow intelligent management of tactical networks based on learning and automatically adapting to network conditions, resulting in optimal networking performance. Cognitive Network Management adaptively configures all layers of the network stack to support mission requirements in varying environments.

Technology: Cognitive Network Control, Learning & Reasoning

Definition: Technology that provides communications and applications customized for Warfighter needs by conforming to mission plans. The ability to provide technology that will address the challenges associated to cognitive protocol stack, such as cross layer joint route selection, and spectrum aware fast reroute. Cognitive technology will also increase quality of service of all layers of the stack. Technology that apply concepts from social networks to network structure and topology formation that will improve information flow, and improved organizational hierarchies.

Technology: Cross Domain Solutions (CDS)

Definition: Technology providing the ability to transmit data, voice, and multimedia across security domains. Within military and intelligence domains, classification level and need-to-know directives define the sensitivity of information. All information at a particular sensitivity level constitutes a security domain. The effective conduct of operations often requires sharing of information across the security domains. Cross-domain solutions ensure information availability while guaranteeing information security.

Technology: Metamaterials and Other Novel Technologies for Conformal Antennas

Definition: Research and develop new antenna technologies that provide the improvement in capability and additional functionality necessary to meet future force Warfighter requirements. New technologies will enable the efficient and effective design of conformal and multifunction antennas with reduced cost, size and weight for all army platforms. Three critical research areas have been identified: platform feed systems, evolutionary aperture design, and metamaterial antenna technologies. These technologies will bridge the current gap between future force requirements and current antenna technology.

Technology: Low Cost On-the-Move (OTM) SATCOM Antennas

Definition:

•Warfighters require extended-range, robust communications networks that expand the commander's reach and allow him to conduct simultaneous, distributed operations with more capable forces. OTM SATCOM antennas allow for this extended range communication.

•Small aperture (less than 18") SATCOM antennas that are self contained and mount on vehicles, when integrated with user modem and equipment, can provide the needed network-enabled communications while OTM. Low cost, space, weight and power ($SWaP) is needed to satisfy critical requirements such as WIN-T Increment 2 Soldier Network Extension (SNE).